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UNIVERSITY OF NEBRASKA–LINCOLN WATER CENTER

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Water Current

PART OF THE SCHOOL OF NATURAL RESOURCES

MEET THE FACULTY

Martha D. Shulski, Ph.D.

Martha Shulski directs the High Plains Regional Climate Center at the University of Nebraska–Lincoln and is an assistant professor of applied climate science in UNL's School of Natural Resources since August 2009.

Education:

B.S., Meteorology, Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University, 1996.

M.S., Agricultural Meteorology, Department of Agronomy, University of Nebraska–Lincoln, 1998.

Ph.D., Soil Science/Climatology, Soil, Water, and Climate Department, University of Minnesota, 2002.

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INSIDE

Tour Examines Sharing Limited Platte Basin Water

By Steve Ress

A four-day July water and natural resources tour will examine the challenges of sharing limited water supplies in the North and South Platte River basins in Nebraska, Colorado and Wyoming, including a visit to the U.S. Bureau of Reclamation's (USBR) North Platte irrigation project.

Pathfinder dam and reservoir form the heart of the U.S. Bureau of Reclamation's North Platte irrigation project in central Wyoming. Participants on this July's summer water and natural resources tour will see much of the project and tour the USBR's district operating offices in Mills, Wyo.

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Daugherty Foundation Funds Water for Food Institute

In April, The University of Nebraska announced a $50 million founding gift commitment from the Robert B. Daugherty Charitable Foundation to support a global *Water for Food Institute*. The gift, one of the largest in the University's history, will create a multi-campus center for research, education and policy analysis relating to use of water for agriculture.

Water for food is one of the top priorities identified by the University in its $1.2 billion Campaign for Nebraska announced last October.

NU President James B. Milliken said the gift will allow the University to become a global resource for developing solutions to the challenges of hunger, poverty, agricultural productivity and water management.

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From the Interim Director
Bruce Dvorak

$50 Million Donation Makes Water for Food Institute a Reality; UNL Hires Watershed Hydrologist; Upcoming Activities

As you no doubt are aware, the University of Nebraska recently announced a $50 million founding gift from the Robert B. Daugherty Charitable Foundation to support a global Water for Food Institute. This gift is one of the single largest in the University's history and will help create a multi-campus center for research, education and policy analysis relating to use of water for agriculture.

It is a bold and far-reaching step that will help the University build on core research expertise and experience in many disciplines to help solve global hunger.

Initially, the Institute will be housed in the historic Whittier Building, a state-of-the-art facility that also houses other high-priority UNL research centers, including the Nebraska Center for Energy Sciences Research and the Nebraska Transportation Center. A location on the Nebraska Innovation Campus, at the former Nebraska State Fairgrounds, is being planned.

The Institute will be highly interdisciplinary and will engage many of the Water Center's affiliated faculty. It could involve faculty from nearly every college and many disciplines in the University, ranging from agriculture, engineering, sociology, and business to computer science, law, journalism, geosciences and political science.

It is also anticipated that funding for the Institute will be used to hire a leading water scientist to serve as executive director, as well as hiring top faculty in research and policy analysis, with named professorships to attract the best candidates.

Among other ways it is anticipated to use its funds are to bring in visiting scholars, provide fellowships and scholarships for top students, develop a global journal on water for food, sponsor a premier annual educational conference on water for food, and establish a research stimulation fund to attract additional federal and private funding.

The new institute will not replace the UNL Water Center, which will continue conducting the research, outreach and extension functions that are vital to Nebraska and the Great Plains region. It is certainly envisioned that there will be many opportunities for the Water Center and the Institute to work together on many issues that not only are important to Nebraskans, but all citizens of the globe as we look at doing more with finite resources of land and water.

Ultimately, the Institute and Water Center will help strengthen the University's position in being a global leader in water issues, which will ultimately make NU a leader in attracting great talent and expertise to our state and by providing additional resources to serve Nebraska and the world in increasing producer ability to grow more food with the same amount, or less, water.

Even in tough economic times such as these, the University of Nebraska–Lincoln

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John E. Gilley, Ph.D., P.E.

John Gilley is an agricultural engineer with the U.S. Department of Agriculture – Agricultural Research Service and adjunct professor (100% research appointment) in the University of Nebraska–Lincoln's Department of Biological Systems Engineering since September 1982.

Education:

B.S., Physics and Mathematics, Southern Colorado State College, 1972
M.S., Agricultural Engineering, University of Minnesota, 1974
Ph.D., Agricultural Engineering , Colorado State University, 1982

Examples of Current Research:

My current research focus is to identify sustainable cropping, management, and conservation practices that utilize manure as a valuable nutrient source for crop production while minimizing adverse environmental impacts. Results from this work will enhance our understanding of the important mechanisms influencing nutrient transport following land application; provide greater knowledge on the effects of selected manure application procedures on the delivery of nutrients by overland flow; and identify the effectiveness of various conservation practices on nutrient transport from cropland areas. This information will allow producers to select management alternatives best suited to their production strategies while maintaining established environmental standards.

Examples of Past Research:

I have conducted research in the past to improve understanding of the runoff, erosion, and hydraulic characteristics of upland areas. For nine years I participated in USDA efforts to develop new generation erosion prediction technology and was responsible for development of the hydraulics component of the Water Erosion Prediction Project (WEPP) Model. I have also identified management practices that maintain soil quality benefits when Conservation Reserve Program areas are converted to cropland. I have helped to establish the use of vegetative barriers as an accepted conservation practice for reducing soil loss and nutrient transport from cropland areas.

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Martha D. Shulski, Ph.D. *continued from page 1*

Examples of Current Research:

My research focuses on the understanding of climate variability and change, particularly at the regional level. In an area such as the Great Plains, the variability in our climate even from year to year is inherently high and this can have significant impacts to agriculture, water resources, and the associated seasonal planning activities. In addition, extreme weather events such as flooding and heat waves can create added stress on the environment and society, particularly when the timing coincides with a key point in the growing season, for example. By analyzing historical data we can get an idea of the full range of past weather events (from the normal to the extreme) and answer key questions such as, What caused the event? and What were the impacts to various sectors? Through the incorporation of regional climate model output we can assess future climate scenarios, which will allow for enhanced decision-making capabilities and reduced risk for regional stakeholders. Prior to coming to UNL in August of 2009, I researched the same topics, though my regional area of interest was Alaska and the Arctic – an area experiencing rapid environmental change.

Examples of Past Research:

Climate variability and change for high latitude regions, Alaska regional climatology, Extreme events and impacts

Examples of Outreach Programs:

Public education on climate change and variability, Primary and secondary education on weather, climate, and climate change

Teaching:

Applied Climate Science capstone course [planned]

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Two Water Events Come to Lincoln in October

Back-to-back water events are coming to Lincoln's downtown Holiday Inn in early October.

The University of Nebraska–Lincoln Water Center will host a daylong water law conference on Wednesday, Oct. 6, then joins with the U.S. Geological Survey's Nebraska Water Science Center to present a daylong "Greater Platte River Basins Symposium" at the same location the following day, Thursday, Oct. 7.

"The Wednesday conference will focus on Nebraska water law for the practicing attorney and other legal practitioners, but is open to all," said organizer and UNL Water Center assistant director Lorrie Benson.

Continuing Legal Education (CLE) credits will be applied for, she noted.

The following day's "Greater Platte River Basins Symposium" will present the latest research and programming on the Niobrara, Platte and Republican River basins.

"It's something of a continuation of the very successful Platte River symposium that was held in Kearney last fall, but will be broader in scope by going beyond the Platte River basins," Benson said.

The call for abstracts is open through June 14 with information on submissions available online at watercenter.unl.edu. Anyone with research or innovative programming in any of the basins is encouraged to submit an abstract for an oral or poster presentation. Registration will open in August, and participants can register for either or both events at that same online site. A discount registration rate will be available for those registering for both events, Benson said.

Extension Protects Waterways from Stormwater Runoff

Water — even stormwater — is taking center stage in Nebraska.

Subsequently, thanks to a grant awarded to University of Nebraska–Lincoln Extension, Nebraska's lakes, rivers and ponds soon may get a little cleaner.

Extension received a $544,000 grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture to increase education and research ways to protect the state's waterways from urban stormwater runoff carrying sediment, fertilizers, automotive fluids and other substances, said UNL Extension Educator Kelly Feehan, based in Columbus.

"It's all about water," Feehan said. "Water quality and quantity is a major focus in the state of Nebraska, and with urban areas growing there is increased focus on reducing the volume of urban stormwater and pollutants in stormwater."

The grant, awarded last year and extending through August 2012, focuses on extension education, classroom instruction and research.

The goal is to conserve water and improve water quality through an integrated approach to stormwater management and greenspace use in 10 Nebraska cities with populations of 10,000 to 50,000, Feehan said. The cities are Scottsbluff, North Platte, Lexington, Kearney, Grand Island, Hastings, Columbus, Norfolk, Fremont and Beatrice.

An extension educator will focus on developing informational materials and conducting educational outreach for community leaders, citizens, Master Gardener volunteers, 4-H youth and others.

The grant also will support a new curriculum on stormwater management for use in UNL's landscape architecture and design classes, and research on installed rain gardens. Graduate teaching and research assistants will be hired to help, Feehan said.

Working with Feehan are David Shelton, extension agricultural engineer at the Haskell Ag Lab in Concord; Thomas Franti, surface water management specialist in Lincoln; Steve Rodie, landscape horticulture specialist in Omaha; and others.

Progress already is being made in the 10 cities, with some storm drains having markers that read "No dumping. Drains to waterways."

"This is increasing awareness of stormwater issues and the need for education to address stormwater management with viable cost-effective solutions," Feehan said.

Groundbreaking Research Showing Evolution Can Impact Ecology

By Steve Ress

Most of us can accept the theory that given enough time and influence, the environment a species lives in will shape its changes, or evolution, but a University of Nebraska–Lincoln researcher is helping prove that the opposite is true, as well.

UNL School of Natural Resources stream ecologist Steven Thomas is part of a multi-university, multi-disciplinary five-year, $5 million National Science Foundation (NSF) grant investigating the interaction between ecological and evolutionary changes, using the common guppy (*Poecilia reticulata*) as its focal organism.

"We've compiled significant data showing us that not only does ecology shape the evolution of a species, as we've all been taught to believe, but that the evolution of a species can shape its surroundings, or environment," Thomas said.

Guppies were chosen as the target species for the research because their basic traits are well documented and they evolve rapidly. They're also native to relatively pristine and untouched streams on the island of Trinidad, which makes for the perfect natural laboratory.

The research, begun about four years ago, is the first comprehensive effort to experimentally study links between ecology and evolution in real time in a natural ecosystem, Thomas said.

The program director of NSF's division of environmental biology, that funds the research, Alan Tessier, said that documenting that rapid, adaptive evolution within (a) single species can cause substantial changes in ecosystem structure and function, this study makes a significant contribution to merging ecological and evolutionary theory.

Thomas puts it more simply than that, saying "This projects is providing empirical data on how a species and its environment change in tandem." Popular notions that evolution operates too slowly to produce ecological consequences over observable time scales, such as less than 10 years, are not always correct, he said.

What he and fellow researchers are observing in the pristine and closely monitored stream reaches of Trinidad is that evolutionary changes begin occurring to guppies soon after predation risks are altered. Trinidadian streams are conveniently segmented by waterfalls that isolate guppy populations. As an observer moves upstream, barrier waterfalls cause fish species to drop out until only guppies and a competitor fish are left. In the absence of predatory fish, guppies develop distinct life history strategies and ecological roles. Changes include such traits as offspring size and number, age and size at maturity, as well as certain aspects of growth, aging, and feeding.

Thomas said that from an earlier study, he and biologist David Reznick of the University of California, Riverside, who is leading the 11-member interdisciplinary NSF study, knew that guppies can evolve rapidly and that in this study, that are better able to quantify the ecological impacts of those rapid changes.

In Trinidad, Thomas, Reznick and their colleagues colled guppies from two different communities and quantified their impact on a stream ecosystem by placing them in a controlled stream environment, near the natural channel, that they create by diverting spring water through artificial mesocosms, systems larger than a microcosm but smaller than a macrocosm, which then return the water to the natural stream.

They then added insect larvae, food for the guppies, into the artificial streams. What they found, Thomas said, was that the guppies from the more diverse fish community (those with predators) eat more insect larvae versus guppies from low predation settings that eat more algae. Guppies from high predation sites also excrete more nitrogen than do other guppies. Combined these differences cause a cascade of effects that influence plant growth, daily oxygen patterns and the rate at which plant matter decays.

These smaller scale experiments compliment whole-stream scale experiments currently underway.

In these experiments guppy introductions are combined with light manipulations to examine how specific ecological conditions influences the evolutionary path followed by these fish and what the ecological consequences of those changes are.

Using a marking system that identifies individual fish and an extensive mark and recapture procedure, Thomas' colleague's can quantify changes in fish traits, life history characteristics and population changes.

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Frogs and Atrazine: What Doesn't Kill You Can Turn You Female

By Alan S. Kolok, Ph.D., Aquatic Toxicologist, Department of Biology, UNO; Department of Environmental, Agricultural and Occupational Health, UNMC

The German philosopher Freidrich Nietzsche is credited with saying "What doesn't kill us makes us stronger." While that may speak volumes for the inherit resilience of the human spirit, Nietzsche's quote is highly inaccurate when applied to endocrine disrupting compounds.

For example, in a recent article in *Proceedings of the National Academy of Sciences*, Dr. Tyrone Hayes and his colleagues have found that aqueous exposures of the herbicide atrazine cause male frogs to become feminized. The study reports that 10 percent of these altered frogs develop into functional females that copulate with unexposed males and produce viable eggs!

While not killed, the effect of atrazine on these male frogs certainly didn't make them any stronger.

How can aqueous exposures to atrazine lead to such striking reproductive changes in a male frog? The answer can be found in how chemical signals influence animal development.

Endocrine disrupting compounds do not act in the same way as classic toxic molecules, but rather they mimic or alter natural cell signals. To understand this, consider for a moment the true complexity of a living cell. Cells in different tissues have different job descriptions and to perform those functions they express different groups of proteins.

The genetic blueprint for all of this cellular machinery, DNA, resides in complete form within every single cell. Therefore cell specialization requires that each cell read the correct portions of the genome to appropriately express the proteins that it will need to perform its assigned function.

Cells receive chemical signals, including hormones, which determine the portions of the genome that should be read and translated into protein. Appropriate interpretation of these cell signals, to a large degree, is essential for proper cell and tissue development.

But what if the cell signals are wrong? Inappropriate cell signals can cause all kinds of mayhem, including production of proteins in cells that have no business expressing them. Inappropriate gene expression in an adult can be reversible and therefore relatively benign. Inappropriate gene expression during development, however can lead to irreversible changes in body architecture and the consequences can be devastating.

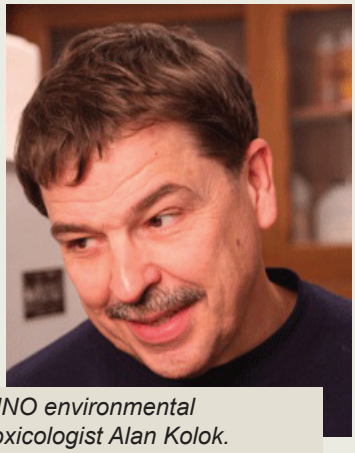
In gonads, development is under the domain of two primary cell signals, testosterone and estradiol. These two cell signals are responsible for the familiar, though dramatic, changes that occur during puberty.

They are also responsible for the organization of gonad tissues during the very earliest stages of development. Furthermore, the chemical structure of testosterone is closely related to estradiol, and a single enzyme aromatase, can convert the male signal into the female one. As such, the activity of one enzyme can dramatically alter the fate of the developing ovary or testis.

So what, exactly is happening with Hayes' frogs?

During early sexual development, atrazine stimulates aromatase to convert the male frog's testosterone into estradiol, thereby signaling the primordial gonad to develop in a very feminine fashion.

The result: wholesale castration of the male frogs thus exposed and in 10 percent of them wholesale conversion of a genetic male animal into a reproductively viable, morphologically female one.



UNO environmental toxicologist Alan Kolok.

Hayes argues that atrazine can feminize frogs at levels well below those considered safe by the U.S. Environmental Protection Agency. The disagreement is not as incongruous as it might originally seem, as EPA's approach toward atrazine has focused on a classic toxic response, whereas Hayes' approach focuses on amplification of a very strong, but inappropriate, feminizing cell signal.

Toxic compounds that do not kill us may not necessarily make us stronger. If the compound is an endocrine disruptor the outcome may not be fatal, but can have equally dire, developmental consequences.

Niobrara's Uses in Balance

By Leslie Reed, Omaha World-Herald

Is the Niobrara River more valuable as a water supply for irrigators, as a source for electrical generation or for the tourism dollars generated by its scenic beauty and recreational appeal?

That is the question economist Steven Shultz has been asked by the Nebraska Game and Parks Commission as it considers whether to seek protections for the benefit of wildlife and recreation on the Niobrara.

The river's multiple uses seem to be in a state of equilibrium for now, Shultz said. Recreational users complain more about the peak-season crowds than they do about too-low water levels.

"Right now you could not justify retiring irrigation rights on behalf of recreation," he said. "But what happens in the future if there is drought or expanded irrigation?"

His report on the river's value for irrigation and electricity generation won't be completed before the end of the month. However, Shultz offered some hints about his findings during a meeting Wednesday with state senators and lobbyists interested in water issues.

Although much of the land in the Niobrara basin is pasture, it appears that about 750,000 acres are under irrigation.

Shultz said he is still is working with

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LPRCA Announces Seminar Surveys

The Lower Platte River Corridor Alliance (LPRCA) is beginning to plan for product rollout seminars that will showcase the Environmental Suitability Assessment (ESA) and partner programs for the lower Platte River corridor.

Part of the planning process involves a pre-rollout seminar survey, intended for anyone who has an interest in programs and events of the lower Platte River corridor.

"LPRCA recognizes that growth in the lower Platte River watershed is inevitable and efforts are needed to ensure the sustainability of the natural resources of the area," said Meghan Sittler, who directs the LPRCA. "We believe public participation is crucial in this process and we are very eager and excited to hear the public's opinions on the LPRCA and its' programs and resources."

Product rollout seminars will present the ESA and other important programs taking place in the lower Platte River to stakeholders, agencies, municipalities, the public, or anyone interested in successful management of the Lower Platter River Corridor. Seminars are expected to take place this summer.

LPRCA partners include the Nebraska Land Trust, U.S. Army Corps of Engineers, Nebraska Department of Environmental Quality, Natural Resource Districts, U.S. Geological Survey, Nebraska Game and Parks Commission, University of Nebraska–Lincoln Conservation and Survey Division and Water Center, and Lower Platte River Weed Management Area.

For more information and to take part in the LPRCA's pre-rollout seminar surveys, go online to www.lowerplatte.org.

Drinking Water Wells Vulnerable

A new U.S. Geological Survey (USGS) study explains what, when, and how contaminants may reach public-supply groundwater wells.

All wells are not equally vulnerable to contamination because of differences in the general chemistry of the aquifer, groundwater age, and direct paths within aquifer systems that allow water and contaminants to reach a well.

More than 100 million in the U.S. get their drinking water from public groundwater systems, which can be vulnerable to naturally occurring contaminants such as radon, uranium, arsenic, and man-made compounds, including fertilizers, septic-tank leachate, solvents and gasoline hydrocarbons.

USGS tracked the movement of contaminants in groundwater and in public-supply wells in four aquifers in California, Connecticut, Nebraska and Florida. The importance of each factor differs among the various aquifer settings, depending upon natural geology and local aquifer conditions, as well as human activities related to land use and well construction and operation. Findings in the four different

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Healthy Water Healthy People: Empowering Educators

By Tadd Barrow, UNL Extension Educator, Water Quality

The U.S. Environmental Protection Agency employs a classification of "Designated uses" to determine what level of health water must meet. Water quality standards, or allowable levels of contaminants, are assigned to each of these uses.

The most stringent standards apply to drinking water used in public water supplies followed by fish and wildlife, recreation, agriculture and industry, navigation and other uses (hydroelectric, ground water recharge, etc.).

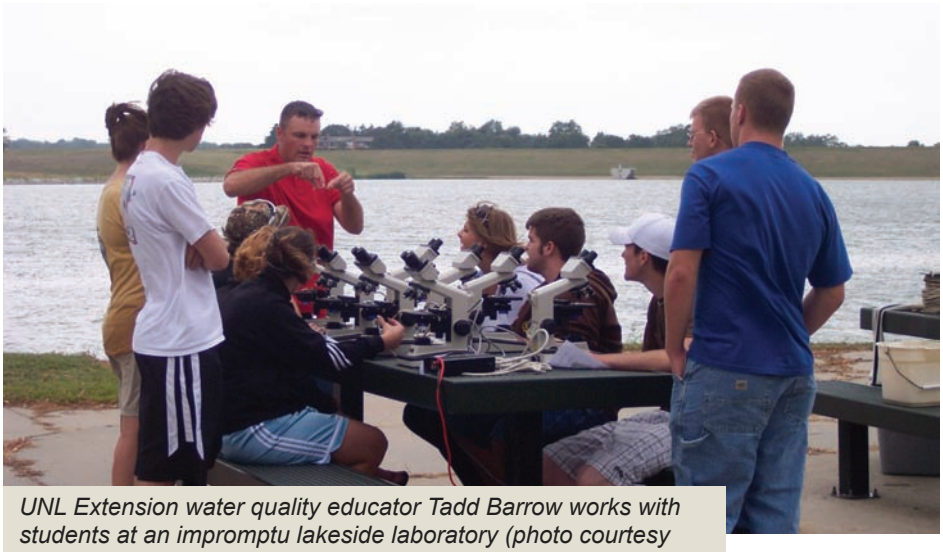
To help make more informed decisions tomorrow, today's youth must understand water resources and the relationship of water to personal, public and environmental health. Yet, research from the National Environmental Education Foundation reports that fewer than half of high school teachers teach environmental education. In many cases, middle and high school teachers don't feel prepared to teach complex water quality issues and their impact.

University of Nebraska–Lincoln Extension has responded to this need by conducting three-day Healthy Water- Healthy People (HWHP) workshops for formal and non-formal educators. UNL Extension personnel provided expertise and training on water quality and quantity issues and facilitated numerous hands-on group activities that encourage student interaction and stimulate learning while doing.

Educators who attended a workshop were empowered to teach complex water quality concepts that have reached thousands of students across Nebraska.

Participants were sent surveys two years after attending a workshop to assess if and how they were using the HWHP curriculum in their teaching. Every educator and teacher responding commented that HWHP workshops increased their overall knowledge, awareness, appreciation and understanding of water quality topics. To avoid bias, an identical exam was given to workshop participants before the workshop, and as follow up after. Results of "knowledge gained" were verified by a 53 percent increase in post versus pre workshop exam scores.

Students learn some of the rudiments of sampling for water quality through programs taught by extension educator Tadd Barrow of UNL's School of Natural Resources (photo courtesy Tadd Barrow).



UNL Extension water quality educator Tadd Barrow works with students at an impromptu lakeside laboratory (photo courtesy Tadd Barrow).

Participants reported the knowledge gained at the workshop helped them in teaching complex concepts and provided a conduit to making the material meaningful and fun for the learners.

Some examples of how HWHP materials were used to educate clientele are: 1) Assisting middle school students compare water quality and quantity, 2) Strengthening Natural Resources District water-based curriculum for large outdoor conservation days, and 3)

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Featured Partner: Nebraska Society of Professional Soil Scientists

By Duane Mohlman, UNL Water Center

The Nebraska Society of Professional Soil Scientists (NSPSS) represents Nebraska's professional soil scientists and others interested in supporting the organization's goals and activities. The organization is a networking tool for soil scientists and help in educating others in the importance of soil resources, investigations and data.

According to their mission statement, "The mission of the Nebraska Society of Professional Soil Scientists (NSPSS) is to advance and promote the science of soil and the soil scientist profession by encouraging ethical and professional communications and cooperation among soil scientists, allied scientists, other earth scientists, and all other persons interested in Earth Sciences through the medium of formal and informal meetings, field trips and other activities.

Specifically, NSPSS goals are the following:

Encourages professional and ethical standards among Nebraska soil scientists; Encourages professional communications and cooperation among soil scientists, allied scientists, other earth scientists, and all persons interested in Earth Science; Encourages each NSPSS member to become ARCPACS certified.

NSPSS conducts an annual summer tour, focused on time-appropriate topics such as: soil management, soil taxonomy, wetlands, hydric soils, soil interpretations, and other topics closely related to soil science. Plans for the upcoming 2010 summer tour are currently underway.

NPSSS is actively involved in educational outreach. Recently, they purchased 30 copies of *Dig It - The Inside Scoop - Soils Book for Children*, which were distributed to education/outreach coordinators in Nebraska's Natural Resources Districts. From there, they are loaned to local schools. In addition, NSPSS teamed with Kiwanis to provide bags of soil to all Lincoln, elementaries. The bags contain a variety of soil textures, which allows students to see, feel and discuss various soil types.

NSPSS is also active in post-secondary education. This fall, NSPSS will help sponsor the Region Five collegiate soil-judging contest, in North Platte. The four top teams will qualify for the national championship.

According to Mark Kuzila, soil scientist, and director of the University of Nebraska–Lincoln's Conservation and Survey Division, part of UNL's School or Natural Resources, soil judging contests give students valuable experience. "Soil science is a team activity. When you are in the field, you are rarely alone. One soil scientist may identify a soil as one thing, and another soil scientist may have a similar, but not identical, identification. Collaboration is the key to solving the puzzle of a soil profile. Soil judging contests provide an opportunity to develop these kinds of collaborative skills."

In addition, soil judging contests provide a means for undergraduate students to meet professors from a variety of colleges and universities. "When undergraduate students and faculty judges collaborate at soil judging contests, they sometimes develop a relationship that can potentially lead to graduate work at that faculty member's institution," said Kuzila.

The majority of NSPSS membership is from the U.S. Department of Agriculture's Natural Resources Conservation Service and UNL. Although relatively small in number, they are a strong force for professional development.

Kuzila credits NSPSS "For providing the networking framework for professional soil scientists to exchange research, ideas and new technologies and techniques in the field of soil science".

NSPSS's Board of Directors regularly meets to plan upcoming projects and events. To save on travel and costs, the meetings are often held in conjunction with other soils-related meetings, such as the NRCS conference.

NSPSS strongly encourages its members to become certified in one of several areas of American Registry of Certified Professionals in Agronomy, Crops, and Soils (ARCPACS).

NSPSS was a founding member, and strong catalyst, for the *The United States Consortium of Soil Science Associations* (USCSSA).

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UNL soil scientist Mark Kuzila works with students on identifying soil types (photo courtesy Mark Kuzila).

UNL Scientists Take to the Sky

By Lori McGinnis, IANR News Service

Rick Perk is doing much more than traveling while flying over land and water in a Piper Saratoga aircraft. The University of Nebraska–Lincoln assistant geoscientist is conducting research.

With the assistance of two on-call pilots - retired Air National Guard pilot Greg Love and Darrell Nelson, retired dean of the Agricultural Research Division – Perk collects remotely sensed image data for researchers associated with universities and governmental agencies across the United States.

UNL's Center for Advanced Land Management Information Technologies has been conducting the research since the early 2000s. That's when a National Science Foundation grant allowed for the purchase of the aircraft and a subsequent NASA EPSCoR (Experimental Project to Stimulate Competitive Research) grant provided money for an Airborne Imaging Spectroradiometer for Applications, or an AISA sensor system.

The AISA imager installed in the aircraft collects and records the quantity of visible and near-infrared light reflected from a target on the surface.

"To the untrained eye, we're taking pictures," Perk said.

However, much more is involved. The AISA system collects multiple "looks" at a single target from different portions of the visible and near-infrared portions of the spectrum, Perk said. The multiple images provide detailed, high quality spectral data to analyze conditions related to a specific target.

For example, the data will reveal the level of chlorophyll in plants, which is an indirect indicator of fertilizer requirements. It also will predict potential toxic algal blooms in water based on the presence and quantities of specific algal pigments.

"UNL is the only university with a program capable of providing this type of airborne research support and data collection capability, and as such has been hired to conduct the research both locally and across the country," Perk said.

One benefit from operating the AISA is an ongoing collaboration with the Nebraska Department of Environmental Quality to monitor Nebraska lakes, including the Fremont State Lakes Recreation Area.

Previously, the DEQ and the School of Natural Resources conducted traditional water sampling and analysis and CALMIT graduate students studied spectral data collected on-site.

The airborne imagery allows for accurate and detailed analysis of the toxic algae levels throughout every square meter of the lake system without the need for additional ground data collection.

"Traditional lake monitoring protocols are very time and labor intensive," Perk said. "Using the airborne system, data can be collected and a map can be generated in about five hours."

Similar efforts have been conducted at Carter Lake near Omaha, Lake Minnetonka in Minneapolis, the Choptank River near Easton, Md., and three lakes in the greater Indianapolis area.

Pilots Greg Love, left, and Darrell Nelson, right, help geoscientist Rick Perk conduct remote-sensing research that's used by universities and government agencies across the country. (IANR photo by Brett Hampton)

Other AISA work has included monitoring invasive species along coastal and inland waterways, carbon sequestration, wheat streak mosaic virus and evapo-transpiration related to cropping systems and riparian areas.

Not all of the research is conducted from the plane. In addition to the airborne data collection system, CALMIT also conducts close-range research of the same areas using non-imaging equipment. But it is the work with AISA that is setting UNL apart.

"The airborne program was originally conceived to augment CALMIT's world-class field data collection capabilities and systems," Perk said. "The program's success is well beyond most early expectations and now provides airborne services to a much larger local and national research community."

Image data have been provided to researchers associated with four federal agencies, six state agencies and 32 universities in 20 states, he said. About 10 terabytes of image data and products have been collected, processed and delivered to the research community through the program.

Challenges of Collaborative Water-Related Decision Making

By Sarah Michaels with Rachael Herpel and Becky Swainson

(Editor's Note: This is the second in a series of briefing notes prepared under the Canadian Water Network project Governance for Source Water Protection in Canada. Here we discuss common challenges of collaborative decision-making).

Now more than ever in making decisions about water, including the protection of source water, there is concern about the process and context in which decisions are made. Historically, government agencies have dominated decision-making using a top down approach. More recently, however, a wider array of participants is included in water-related decision-making processes.

Goals underlying this shift can include democratizing the process, adding legitimacy to the outcomes, strengthening the capacity of local communities, and increasing likelihood of plan implementation.

There is much enthusiasm for these joint decision making endeavors, at least on a conceptual basis. However, there also are reasons for caution. Four characteristics of collaborative decision making processes can result in frustration and uncertainty for participants.

High cost of interactions

Fundamental differences exist among people and organizations. Thus, we should anticipate that participating in collaborative endeavors with a diverse group of people will challenge long-held beliefs. Where genuine commitment is required to make long-term collaboration valuable, these interactions can be tense and even troubling for those engaged in them.

For example, water operators focused on maintaining drinking water quality throughout their system, and watershed groups focused on aquatic habitat, will need to understand, appreciate and respect each others' perspectives for collaboration to succeed.

People weigh their own experiences most heavily

We know from research into risk communication that people's own experiences trump all other forms of knowledge. A scientist may find it frustrating to participate in a group dynamic where the empirical work that he or she has conducted in accord with professional standards is considered in the same vein as observation provided by people with less technical expertise.

Similarly, people who have experienced a problem first hand in their community may find the perspectives of outside scientific experts to be limited and unrepresentative of local concerns.

Nothing happens quickly, and then something does

Stable eras of incremental policy making may be jolted by circumstances that lead to rapid and dramatic shifts in what is feasible. One consequence is that after a specific event or tipping point, collaborative endeavors may be valued quite differently, and may be required to play roles that differ from the ones that were defined when they were initiated. For example, source water protection programs that struggle to gain community support may find themselves overwhelmed when a potential source of contamination gets media attention. The continuity of financial resources for planning and implementation can also be challenged during uncertain economic times.

Values, not science, arbitrates what happens

The assumption that science-based rationality dominates decision making no longer holds. We know that many other factors, such as values, emotions and social structures come into play when we make decisions. The challenge is to balance the different types of values that exist, and to explicitly recognize and incorporate value-based knowledge with conventional scientific information.

Important Considerations

These challenges suggest a number of questions that those participating in efforts to improve decision-making should consider. Being aware of these common challenges is a critical step towards more productive decision-making processes.

- Who is not included (but needs to be) if the intended aim of the collaborative initiative is to be achieved?
- How well does each participant understand the different perspectives held by others at the table?
- If individuals weigh their own experiences most heavily, under what circumstances are people around the table most amenable to hearing and considering information that is not in accord with their experiences?
- Considering that the wider context may change during the life of the process, how robust is the process to external shocks? How applicable will decisions and recommendations be under a range of possible scenarios? How can the initiative take advantage of a window of opportunity to consider new viable options?
- Given that values, not science, may decide the outcome of a process, how will values and scientific expertise be incorporated into decision-making?

Even if all of these questions are considered explicitly by participants in collaborative decision-making processes, it still is important to maintain realistic expectations about possible impacts and outcomes. For instance, research on the collaborative management of California's Bay-Delta region (see box) has demonstrated that, from participants' perspectives, dividends didn't come from the first multi-year planning

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Harvesting Rainwater Makes Good Landscape Sense

When it rains in Nebraska we usually are thankful for the moisture. Why then do we design our properties and landscapes to move rainwater away as quickly as possible? Why not harvest some of it to help conserve water resources?

Rainwater harvesting isn't new, but it is making a comeback in practices such as rain barrel use. Rain barrels are fairly limited in the amount of rainwater they collect, but newer methods are also being used. Bioretention gardens, rain gardens, planter boxes, vegetated swales and green roofs are examples of rain harvesting methods being used in home, business and community landscapes.

How we view rainwater run-off is changing. Traditionally, in urban communities, rainwater is referred to as stormwater and treated as something to be moved off site as quickly as possible via curbs, gutters, storm drains and pipes.

Water run-off, from rain and snow melt, is beginning to be viewed as a resource to capture and reuse or allow to soak into soil through green space features such as rain gardens. When this is done, the volume of stormwater run-off from a property is reduced, water is returned to soil to increase soil moisture, and pollutants are filtered.

As stormwater flows from rooftops and across surfaces to storm drains, it picks up pollutants such as sediment, fertilizer, grass clippings, and oil dripped on driveways. Stormwater is not treated to remove pollutants. It is discharged from curbs to storm drains to streams, rivers and lakes, taking pollutants along with it which impacts surface water quality.

Designing and installing landscape features to harvest rainwater not only conserves and protects water resources. It also can save money on water bills, increase property values, conserve energy by cooling the environment, improve air quality by plants absorbing air pollutants, and enhance the aesthetics of residential and community landscapes.

For home landscapes, rain barrels, rain gardens and the use of porous surfaces such as bricks on sand or porous pavers for patios are rain-harvesting methods being used. Don't overlook simple roof downspout redirection. In place of water from downspouts being directed to a paved area, redirect it to a planted area away from the building.

Redirecting downspouts to a rain barrel or rain garden is an even better option. Today's rain barrels are screened to keep out mosquitoes and designed to direct overflow away from a building's foundation. To remove water from a rain barrel, spigots are attached near the base for garden hose connections.

Although rain barrels are a common way to harvest rainwater, a typical 55-gallon barrel is limited in how much rain can be collected. This is why they are designed for overflow with the overflow being directed to another rain barrel, plant bed, or rain garden.

Rain gardens are fairly shallow depressions of nearly any size with amended soils. They have small berms on three sides and are located where they capture rain from a downspout, lawn, or paved area such as a driveway.

Rain gardens are typically planted to deep-rooted native perennials and grasses that tolerate very short periods of pooling water, but otherwise dry conditions between rain events. Most plants used in rain gardens are readily available and currently planted in Nebraska gardens.

Surface water in a properly designed and installed rain garden will infiltrate and be gone in 48 hours or less with 24 hours being ideal.

To learn how to design and install a beautiful, functional rain garden, UNL Extension NebGuides covering design, construction and plant selection are available at http://ianrpubs.unl.edu.

Another UNL source on rainwater harvesting and other best management practices for conserving and protecting water resources is online at water.unl.edu. Rain garden NebGuides also can be found at this site in the lawns, landscapes and gardens section.

When it rains in Nebraska we usually are thankful for the moisture.

Meet the Faculty *continued from page 3*

John E. Gilley, Ph.D., P.E. *continued from page 3*

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Martha Skulski, Ph.D. *continued from page 3*

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Nebraska Society of Professional Soil Scientists *continued from page 9*

USCSSA is a relatively new framework established to promote national communication and coordination between soils societies and associations. There are currently 48 individual state soil societies/associations, including NSPSS. The ultimate goal is for all soil societies/associations to excel in sharing information and work together in promoting common goals, objectives, and activities. For more information about USCSSA, visit their web site at http://soilsassociation.org/.

Membership applications are available for download at http://nspss.unl.edu. The following membership categories, currently at $10 per year, are available:

Active: Persons with a degree in soil science or closely associated field with equivalent credits or adequate experience to qualify for a soil scientist position and approval of the Executive Board.

Student: Persons working toward a graduate or undergraduate degree in soil science and approval of the Executive Board.

Affiliate: One who does not qualify under any other category but desires to participate in the advancement of soil science

All member categories are encouraged to serve on the organization's committees; however, only active members can serve on the Board of Directors. All categories are encouraged to participate in all meetings, training sessions and events of the organization.

For more information about NSPSS, go online to http://nspss.unl.edu.

Tour Examines Sharing Limited Platte Basin Water continued from page 1

The tour is July 12-15, beginning and ending in Kearney. The University of Nebraska–Lincoln Water Center, Kearney Area Chamber of Commerce, Central Nebraska Public Power and Irrigation District and Nebraska Public Power District jointly sponsor it.

"The tour will take an in-depth look at North and South Platte River basin issues and how they that effect Nebraska from a number of perspectives," said tour co-organizer and host Michael Jess.

Tour stops will be along the North and South branches of the Platte River.

"A tour highlight will be visiting the USBR's North Plate Project, which is one of the most historic and famous federal impoundment projects in the western states and something that everyone interested in Nebraska water issues needs to see," said tour co-organizer Steve Ress of the UNL Water Center. "Nebraska, Wyoming and Colorado are highly dependent on irrigation water and hydropower generated in the North Platte watershed and are legally tied to sharing its waters."

USBR Project construction began more than 100 years ago under then-President Theodore Roosevelt. Water impounded in its series of reservoirs irrigates a large swath of cropland in western Nebraska, above Lake McConaughy.

First day stops and topics on the tour include progress of the Platte River Recovery Implementation Program, Colorado's Tamarack wildlife area and water augmentation program, water supply and use challenges from continuing urbanization of Colorado's "Front range," and allocation of stream flows among irrigators in Nebraska and Wyoming.

There will also be talk of water for wildlife habitat, water well moratoriums and efficiency measures and their impacts on generation of hydroelectric power.

Afternoon discussion turns to Colorado/Nebraska interstate water compacts, a visit to Colorado's Tamerack water augmentation project for the Platte River and recent water well shutdowns in eastern Colorado that have left many groundwater irrigators high and dry.

Overnight is in Fort Collins, Colo.

On Tuesday morning, July 13, the tour visits the U.S. Department of Agriculture's National Center for Genetic Resources Preservation at Colorado State University before driving north through Cameron Pass and over the continental divide on the way to Wyoming and stops at Seminoe Dam, Fremont Canyon power plant and Pathfinder reservoir, all features of the USBR's North Platte irrigation and hydropower project.

Overnight is in Casper, Wyo.

The following morning, John Lawson, area manager of the USBR in Mills, Wy., will explain operations of USBR's North Platte, Kendrick and Shoshone projects before the tour proceeds to Glendo reservoir and power plant for a picnic lunch and then continues down the North Platte River to Guernsey Dam, near the Nebraska border, which is used to regulate water releases to reservoirs and irrigated lands in Nebraska.

Once in Nebraska, tour participants will hear from local irrigation district managers and examine the Fort Laramie and Interstate canals, as well as the Whalen and Tri-State diversion dams. Discussions will include operations in the Farmers Irrigation District, near Scottsbluff, and the importance of return flows for surface irrigators in western Nebraska.

Overnight is in Scottsbluff, where a western barbeque near Chimney Rock is planned.

On the final day of the tour, Thursday, July 15, discussion moves into controlling water-robbing invasive species that choke many reaches of the Platte River. Steve Brill of the Goshen County Weed and Pest Control District, Torrington, Wy and extension educator Gary Stone of UNL's Panhandle Research and Extension Center in Scottsbluff will lead those discussions.

The tour then proceeds to Bridgeport for an overview of North Platte River operations by Tom Hayden of the Nebraska Department of Natural Resources.

The tour's final stop is in Sidney before returning to Kearney.

Registration mailings for the tour will be done in late May with an anticipated registration deadline of June 28. Registration prices had not been set when the Water Current went to press, but single occupancy registration is anticipated to be approximately $600. Registration will cover all food, motel, and motor coach expenses. Registration is through Jennie Dickey at the Kearney Area Chamber of Commerce at (800) 227-8340.

Additional tour sponsors are the Platte River Recovery Implementation Program, Kearney Area Agricultural Producers Alliance, The Flatwater Group and NU's Institute of Agriculture and Natural Resources.

From the Interim Director *continued from page 2*

is managing to advance its strategic focus of maintaining and improving key research, teaching and outreach focus areas to best serve the citizens of Nebraska. Despite recent budget cuts and the subsequent loss of some positions, we have been able to move another step ahead toward broadening our portfolio of disciplinary expertise in water research with the recent hire of Dr. Diego Riveros-Iregui, a watershed hydrologist who will be tenured in UNL's School of Natural Resources.

Riveros-Iregui will bring to UNL a strong background in water hydrology and a Ph.D. in Ecology and Environmental Sciences from Montana State University. He is currently a research associate at the University of Colorado. He will join UNL's faculty in mid-August.

His research focus has been to incorporate into hydrologic modeling CO2 flux, climate, and soil respiration into watershed modeling, while working with well-respected research groups.

I was very honored to chair the Water POE (Program of Excellence) Watershed Hydrologist faculty search committee that resulted in Riveros-Iregui's hiring. We had a strong pool of applicants for the position and brought in three talented candidates to interview. These interviews ended up going so well that we had an extremely difficult time selecting the top candidate.

I want to personally thank search committee members that devoted so much of their time and efforts to screening candidates for this position. Committee members included Ed Harvey, John Gates, Sheri Fritz, Dean Eisenhauer, John Lenters and Ayse Irmak of UNL and John Miyoshi, general manager of the Lower Platte North NRD in Wahoo.

By the time you read this, registration should be open for our summer water and natural resources tour, which will visit the North and South basins of the Platte River in Nebraska, Colorado and Wyoming July 12-15 (beginning and ending in Kearney). The tour will feature stops at the U.S. Bureau of Reclamation's North Platte irrigation project, in the Rocky Mountains, north of Casper, Wyo. This project, one of the first great successes at bringing water to the arid west, got started under President Theodore Roosevelt at the dawn of the 20th century. It is always among our most requested tour destinations and one we have not visited since 2002. We expect great interest in the tour, so get your registration in early.

The tour will examine a wide range of Platte River issues pertinent to Nebraska. Details of the itinerary are available elsewhere in this issue of the *Water Current.* Remember too that the tour is four days this year, not the usual three, due largely to the shear distances involved in covering the Platte basins in three states. I can assure you that the quality of accommodations and meals will be commensurate with the length of the tour, however. You will be very comfortable…..you will also be very well informed.

Tremendous thanks to our primary and longtime cosponsors, without whom the tour wouldn't be possible: Central Nebraska Public Power and Irrigation District, Kearney Area Chamber of Commerce, and Nebraska Public Power District.

I also want to draw your attention to a two-day event we will be holding at Lincoln's downtown Holiday Inn in early October.

On Wednesday, Oct. 6 we will host a daylong water law conference. The following day, Thursday, Oct. 7, we will join with the U.S. Geological Survey's Nebraska Water Science Center to present a daylong "Greater Platte River Basins Symposium."

Wednesday's law conference will focus on Nebraska water law for the practicing attorney and other legal practitioners and Continuing Legal Education (CLE) credits will be applied for. The following day's symposium will present the latest research and programming on the Niobrara, Platte and Republican River basins. The call for abstracts for this event is open through June 14 and more information on that process can be found online at watercenter.unl.edu

Though the events are separate in nature, there are many that will find both applicable and in that regard, a discounted registration rate will be offered to those opting to attend both events.

We hope to see you at either or both.

If you ever start thinking that everything in the natural world isn't somehow connected, read Kate Shiffler's article in these pages that tells how the recent earthquakes in both Haiti and Chile were felt (recorded) in a groundwater monitoring well near Aurora. This same well, which uses an old, non-state of the art strip chart recorder to make its readings, also reacted to the Indian Ocean earthquake and tsunami that devastated hundreds of miles of Asian and Indian coastline six years ago.

Also, please take a few minutes to fill-out and return the annual reader survey that's on the back page of this issue. Your praise and thanks are gratifying, but your critical comments are most valuable to us in helping make adjustments and improvements to the overall quality of the *Water Current.*

Daugherty Foundation Funds continued from page 1

"By 2050, the world's population will increase by 40 percent and demand for food—produced with finite amounts of land and water—will double," Milliken said. "We have the experience and opportunity to build a global center in Nebraska, leveraging the knowledge and resources of the University of Nebraska and other leading institutions to help alleviate human suffering and food insecurity. We have an opportunity and responsibility to use science to help influence policy and law concerning use of water resources. The implications for individuals, families and nations are tremendous. This is an area of fundamental importance for Nebraska and the world."

Milliken praised the vision and commitment of Robert B. Daugherty, legendary founder of Valmont Industries, the most successful irrigation company in the world and remains committed to the efficient and sustainable use of water to feed a growing world population.

"Bob Daugherty is a true pioneer and visionary," Milliken said. "He helped transform production agriculture and he is now a leader in addressing one of the most critical challenges facing the world. He is the reason the Water for Food Institute will exist and it is a vision that he and the University share that will drive our efforts. I could not be more grateful for his confidence in and commitment to the University."

Daugherty said, "The University of Nebraska is in the right place, at the right time, with the right people to provide global leadership in this important area." Nebraska sits atop the High Plains Aquifer, has more acres under irrigation than any other state and is one of the leading agriculture states in the U.S.

"I have great faith in the University of Nebraska and its ability to make this Institute a place where the best minds come together to find solutions that will improve the quality of life for people around the world through the strategic and responsible use of water," Daugherty said. "Improving agricultural productivity has been my life's work. I can't think of a better investment to sustain that work than this institute."

The Water for Food Institute will build on the University's 60-year history of water research, an area in which the University is already recognized as a national leader, with many faculty working in a wide range of disciplines. Those faculty and NU leaders have been collaborating for two years on plans for an institute that focuses on the strategic use of water for food production – plans that Milliken says can leverage the good work at NU's Institute of Agriculture and Natural Resources to jump start the efforts of the Institute.

"The University plans to create the premier interdisciplinary institute in the world for research, education and policy analysis on water for food, led by renowned scientists and scholars," Milliken said, adding that the institute would be the home of a leading international conference on water for food –initiated in 2009 and held again in May.

Because of its unique and critically important mission, the institute would also be a natural choice for major external research funding from federal science agencies, industry and private foundations, as well as a sought-after source of academic degrees for leaders in the field, Milliken said.

Clarence Castner, president of the *University of Nebraska Foundation*, said the gift is one of the largest single gifts the foundation has ever received. "This is a significant gift to the Campaign for Nebraska and it will provide unlimited possibilities in water and policy research in the future," he said. The gift, which is pledged over several years, brings the campaign total to nearly $736 million toward the $1.2 billion goal, according to Castner.

Groundbreaking Research continued from page 5

Simultaneous measurements of ecological variables like invertebrate and algal community structure and abundance made by Thomas and others helps link changes in fish characteristics to there surrounding ecological conditions.

Though analyses are ongoing, early results indicate how "all of these changes show how guppies change a stream when they are introduced to it and become established," Thomas said.

With their experiments showing that guppies adapting to local environments creates changes in the ecosystem that supports them, Thomas said that the research will now began to focus on how the changed ecosystem shapes how the guppies adapt to it.

The study involves 11 researchers, five post-doctoral students and a couple dozen other students and support technicians having expertise in molecular biology, population ecology, ecosystem science, biogeochemistry and applied mathematics., Thomas directs about $468,000 of the $5.0 million study, working alongside Reznick, as well as Alex Flecker, Cornell University; and Catherine Pringle, University of Georgia on the ecological feedbacks between food web structure and evolutionary changes.

Thomas' portion of the grant employs a full time research technologist, several UNL graduate and undergraduate students and helps support post-doctoral researchers at Cornell and Georgia.

Other colleges and universities involved in the study include Drexel University, Siena College, Colorado State University, North Carolina State University, University of Arizona and Florida State University.

Niobrara's Uses continued from page 7

natural resources districts to confirm the exact figure. Most of the land is irrigated with groundwater wells, not directly from the river. Perhaps 135,000 more acres in the basin are suitable for irrigation, should a current moratorium be lifted.

Shultz, who teaches at the University of Nebraska at Omaha, still is calculating how much irrigation adds to land values in the area, but it appears that farmers are willing to pay an extra $400 per acre for similar land if it's irrigated.

In 2008, Shultz asked canoe and inner tube users when a drop in river levels would stop them from using the river for recreation.

Based on their survey responses, he concluded that as much as $1.7 million per year in recreation-related revenue would be at risk if the river's flows drop significantly because of more irrigation.

Shultz has estimated that recreation on the river boosted the region's economy by $10.5 million in 2008. He predicted that the amount would continue to grow, perhaps by as much as 8.5 percent a year.

He described the river as "a jewel in Nebraska's crown."

"I'm pretty bullish about it," he said. "I think the place has a lot of potential."

Kirk Nelson, assistant Game and Parks director, said the commission is continuing to gather information. It will be at least two years, he said, before a decision is made whether to seek Niobrara flow protections.

Drinking Water Wells continued from page 7

aquifer systems can be applied to similar aquifer settings and wells throughout the nation.

Complete findings, fact sheets, maps and decision support tools ***are available.***

Research on the vulnerability of public-supply wells began in 2001. SGS has also been working since 1991 to study the occurrence of more than 600 naturally occurring and man-made chemicals from more than 1,100 public supply wells across the nation. Scientists found that chemicals are frequently detected, often in mixtures, but seldom at concentrations likely to affect human health.

The quality of drinking water from the nation's public-water systems is regulated by the U.S. Environmental Protection Agency under the Safe Drinking Water Act. Related links to sources of information on public-supply wells ***are available.*** USGS studies are intended to complement drinking water monitoring required by federal, state and local programs, which focus primarily on post-treatment compliance monitoring.

Nebraska Study

In the High Plains aquifer near York, USGS found some contaminants in a public-supply well that seems protected by overlying clay. Nearby irrigation wells have allowed water containing nitrate and volatile organic compounds to leak down from an overlying shallow aquifer into the aquifer that serves as the drinking water source for the public-supply well.

The study in its entirety can be found online at the USGS web site at http://pubs.usgs.gov/fs/2008/3025/

USGS provides science for a changing world. For more information, visit www.usgs.gov.

Health Water, Healthy People continued from page 8

Conducting rural water testing for families to aid their understanding of what is required to ensure safe drinking water.

One teacher used HWHP to assist with concepts on how all parts of the water cycle are connected, and that what you do on your property affects water quality elsewhere: Learners tested well water and quickly realized the importance of implementing best management practices on the landscape to help reduce fertilizer contamination. In another example, an educator was able to utilize a HWHP activity to demonstrate fertilizer contamination: After the activity result, the landowner promised to reduce fertilizer pollution from his lawn and landscape and begin conducting soil tests prior to fertilizing.

The nationally known Project WET program surveyed educators across the country and one of the top issues identified was the need for a water quality education component related to environmental and public health. As a result Project WET led in developing HWHP as an innovative water quality education program that empowers educators, and offers teachers age-appropriate curriculum with hands-on water quality activities for students.

Its purpose is to raise awareness and understanding of water quality topics and issues by demonstrating the relationship of water quality to personal, public and environmental health.

All workshop expenses, teachers' stipends, travel and supporting materials for training conducted in Nebraska were funded by a grant from the Nebraska Environmental Trust.

Challenges of Collaborative Water-Related Decision Making

continued from page 11

process. Instead, they resulted from subsequent initiatives undertaken with others who had been involved in the initial process.

Summary

Collaborative efforts by diverse groups of individuals to make decisions or to advise decision makers are now an integral element of water governance. To increase the likelihood that these endeavors will be successful, participants must acknowledge four common challenges: (1) the high cost of interactions; (2) individuals weigh their own experiences most heavily; (3) nothing happens quickly, and then something does; and (4) values, not science, often arbitrates what happens. Awareness of these challenges and consideration of how they will shape decision making dynamics will help participants navigate the often complex process of contributing their expertise and insights in a collaborative process for water governance.

Acknowledgments

An earlier version of this article, entitled "Seeing around the bend: Understanding the mismatch between engineering and ecological perspectives on restoring the Missouri," was prepared and presented by Michaels as a plenary talk at the Missouri River Natural Resources Committee Conference and Biological Opinion Forum, in Billings, Mt., March 25, 2009. Andrew J. Tyre, associate professor, UNL School of Natural Resources; Jane Ledwin, fish and wildlife biologist, U.S. Fish and Wildlife Service; and Joel Jordan, a long-time source water protection facilitator, Pennsylvania Rural Water Association, provided helpful feedback.

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For more information on the CALFED Bay-Delta Program, go online to http://calwater.ca.gov

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Pioneering Water Center Director Dies in Florida

Warren "Bud" Viessman Jr., pioneering director of the UNL Water Center during its infancy, died at his Florida home on April 8. He was 79.

Viessman, a professor in the UNL Department of Civil Engineering, was the second director of the UNL Water Center, holding the position from 1968 to 1975 and replacing founding director Eugene C. Reed of UNL's Conservation and Survey Division (CSD). The UNL Water Center was established under federal mandate in 1964 and operated largely as part of CSD until Viessman arrived four years later.

According to the *Florida Times-Union*, Viessman passed away at his home in Gainesville, Fla. on April 8 with his family at his side. Born Nov. 9, 1930, he spent most of his youth in the Baltimore, Md. area and received a doctorate from Johns Hopkins University in 1961.

He was professor emeritus of Environmental Engineering Sciences, University of Florida. From 1990 to 2003 he was Associate Dean for Academic Programs of the College of Engineering. Prior to that, he was Chairman of the Department of Environmental Engineering Sciences. From 1975 to 1983, he was Senior Specialist in Engineering and Public Works, Congressional Research Service, Library of Congress.

Viessman was the senior author of widely used textbooks on water supply and pollution control, hydrology and water management. His publications totaled more than 175. In 1978, during his tenure on the Environment and Natural Resources Policy Division of Congressional Research Service, he authored reports on recommendations to President Jimmy Carter's Federal Water Policy Initiatives (WPI), for improvements in cost-sharing policies and a strengthening of environmental considerations in water resources development. He served on numerous national, regional and state committees and commissions.

Warren "Bud" Viessman Jr. directed the UNL Water Center from 1968 to 1975 (UNL Water Center file photo).

He was a Fellow of the American Water Resources Association; and a Fellow, Life Member and Distinguished Member of ASCE. In 2009, Viessman was bestowed with the Lifetime Achievement Award from ASCE's Environmental and Water Resources Institute (EWRI), for his lasting contributions to public service, research and practice in the environmental and water resources profession.

(Editor's Note: Some information in this article was sourced from the American Academy of Water Resources Engineers)

NEWS BRIEFS

USGS Tracks Contaminants

New U.S. Geological Survey (USGS) groundwater studies explain what, when, and how contaminants may reach public-supply wells. All wells are not equally vulnerable to contamination because of differences in three factors: the general chemistry of the aquifer, groundwater age, and direct paths within aquifer systems that allow water and contaminants to reach a well.

USGS tracked the movement of contaminants in groundwater and in public-supply wells in four aquifers in California, Connecticut, Nebraska and Florida. The importance of each factor differs among the various aquifer settings, depending upon natural geology and local aquifer conditions, as well as human activities related to land use and well construction and operation.

Findings in the four different aquifer systems can be applied to similar aquifer settings and wells throughout the Nation.

Learn more about public-supply well vulnerability from USGS fact sheets and video podcast on our website: http://oh.water.usgs.gov/tanc/NAWQATANC.htm.

Looking for Emails

The UNL Water Center isn't about to give-up printed pieces, when and where it's appropriate to use that medium, but like everywhere else, we're conduting more of our business via email.

With that in mind, the Water Center would like to update and add to it's email database and we would like to make sure we have your correct email address for the times when we use that communications medium, such as for conference and symposium announcements, etc.

Please send your email address(es) to Tricia Liedle at pliedle@unlnotes.unl.edu using the subject line "Email database."

EPA to Issue Stricter Standards

By Matthew Daly, Associated Press

The U.S. Environmental Protection Agency (EPA) is tightening drinking water standards to impose stricter limits on four cancer-causing contaminants.

EPA Administrator Lisa Jackson said the agency is developing stricter regulations for tetrachloroethylene, trichloroethylene, acrylamide and epichlorohydrin.

Trichloroethylene, known as TCE, and tetrachloroethylene are used as industrial solvents and can seep into drinking water from contaminated groundwater or surface water. The other two compounds are impurities that can be introduced into drinking water during the water treatment process.

Jackson said EPA will issue new rules on TCE and tetrachloroethylene within the next year. Rules for the other two compounds will follow.

"To make our drinking water systems work harder, we have to work smarter," she said in a speech to the Association of Metropolitan Water Agencies. Jackson called for greater collaboration among states and the federal government, as well as development of new technologies to meet the needs of rural, urban and other water-stressed communities.

The new strategy would address contaminants as a group to improve efficiency; develop new technologies to address health risks from a broad array of contaminants; use a combination of federal and state laws to protect drinking water; and form partnerships with states.

EPA's current approach to drinking water protection is focused on detailed assessments of individual contaminants and can take many years, Jackson said, resulting only in "slow progress."

TCE is especially problematic. The compound was used to clean nuclear missiles and was frequently dumped at missile sites. Exposure can cause nervous system problems, liver and lung damage, abnormal heartbeat, coma and death, according to the Department of Health and Human Services' Agency for Toxic Substances and Disease Registry.

The U.S. Army Corps of Engineers is identifying and cleaning up dozens of former nuclear missile sites in nine states, including 14 in Kansas, 10 in Nebraska, and seven each in Wyoming and Colorado.

UNL students Greg Arthur and Danielle Moore show-off the "Water Machine" to an interested young spectator at a recent "Sunday with a scientist" at UNL's Morrill Hall (photo by Steve Ress).

Young and old alike learned a bit about how groundwater works and what it looks like from UNL Water Center and NU Rural Initiative water education and outreach specialist Rachael Herpel. The demonstration was part of a "Sunday with a Scientist" program on water at UNL's Morrill Hall (photo by Steve Ress).

Rachael Herpel, water education and outreach specialist for the UNL Water Center and NU Rural Initiative shows how groundwater works during a recent "Sunday with a scientist" program at the University of Nebraska–Lincoln's Morrill Hall (photo by Steve Ress).

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Mail or FAX the entire page (so we have your name and address for the drawings). Survey responses and names of responders are confidential to the *Water Current's* editorial staff.

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___ News Briefs

___ Meet the Faculty

___ Reporting on upcoming events, seminars, conferences, tours, etc.

___ Director's Notes

___ Reporting on water and environmental research, survey and outreach activities

___ Featured Partners

___ What's happening with the Water Sciences Laboratory

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